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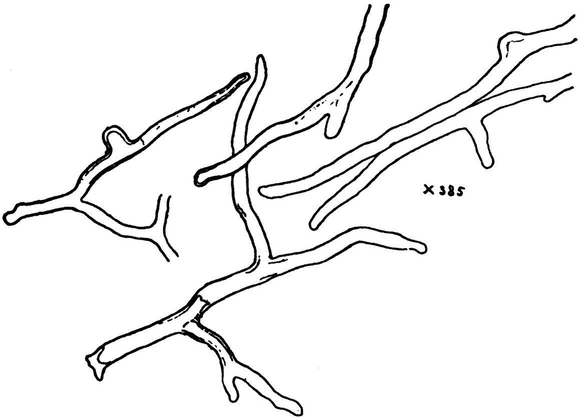

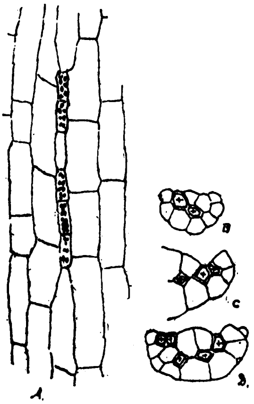

PLATE X. Fig. 1. A few isolated Rhizoids × 385. Reduced ½.

Fig. 2. A. Underside of perichaetial leaf, showing a row of rhizoids-producing cells.

B, C. D. Cross sections through the apex of the ordinary leaves, chlorophyll bearing cells marked × (After Correns).

ASEXUAL REPRODUCTION OF LEUCOBRYUM GLAUCUM.

CHARLES C. PLITT.

In the fall of 1907, and then in the early spring of 1908 I found a peculiar looking *Leucobryum glaucum.* There was no doubting the moss to be *L. glaucum*, but the apical portion of nearly all the specimens of the patch seemed to be attacked by a fungus. Being more particularly interested in the lichens, I thought at first that I possibly had made some interesting and perhaps rare find in lichen study. Expecting to find some apothecia among the many fungus masses, I examined them most carefully with a hand lens, but none were found, nor any likewise later when looked at under the microscope. A sample of the first specimen was sent to Mrs. Smith and the remaining portion laid aside for the time being.

Some time later, Mrs. Smith wrote the following and referred me to Correns:* . . . "It is not attacked by a fungus as you queried, but it is the regular asexual propagation, which is more or less common though this is the first time I have seen it." . . . Examining this apparently "fungus" growth with a microscope, one gets the impression that one was looking at a tangled mass of root hairs. Braithwaite, according to Dr. Grout,† states that this species (*L. glaucum*) often produces on the upper leaves of the female plants minute tufts of "radicular tomentum" with young plants which fall off and serve to reproduce the plant which produces spores rather infrequently.

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* Untersuchungen über die Vermehrung der Laubmoose durch Brutorgane und Stecklinge, by Dr. Carl Correns.

† Mosses with Hand-lens and Microscope, p. 109, and Mosses with a Hand-lens p. 50.

These root-hair like threads fork frequently, intertwine one with another and thus form the impenetrable fungus-like masses; they are of an almost uniform diameter, averaging 6μ although some are found as small as 3μ and some as large as 9μ (Figure 1).

According to Correns (l. c. p. 45), it has long been known that the leaves can produce rhizoids. Schimper, as early as 1848, saw them mainly at the apex of the bracts surrounding the reproductive organs. These rhizoids intertwine and form a thick felt, which prevents any further development of the stem. Upon this felt plantlets develop, after which the entire tuft is covered with them, decays, and forms a substrate for the new plants. He states, that this mode of reproduction happens so frequently, that the spreading of this seldom fruiting moss depends upon it. Berggren, on the other hand, found rhizoids at the apex of the lower leaves, but seldom found any young plants developing, at any rate as long as the leaves remained attached to the parent plants. However, he observed, that when the leaves for some to him unknown cause, perhaps due to age, began to fall, often lying in masses around the tuft, that, not only from the apices but also from the bases of these leaves, rhizoids developed and also green protonemata, and upon both young plants developed. Upon attached leaves, he never found protonema.

To the above two modes, Correns adds still a third mode of asexual reproduction and classifies them as follows:

1. The formation of rhizoids at the apex of attached normal leaves.
2. The formation of rhizoids upon attached perichaetial leaves. (Found only on female plants).
3. The formation of leaves readily breakable from the parent stem. (Brutblätter).

First—The formation of rhizoids at the apex of attached leaves, so far as Correns was able to learn, took place rather late in the life of the leaf, probably in its second year, when it was some distance down the stem and took no longer an active part in assimilation. In all the cases he examined the formation of rhizoids was limited to the upper surface of the apex of the leaf. It is well known that the leaf of this moss is composed of two kinds of cells, of living chlorophyll bearing assimilative cells, and of dead transparent water bearing cells, the latter surrounding the former. Of course the rhizoids can not arise from the transparent cells. Close examination reveals the fact, that although the green cells are surrounded by the transparent ones, yet near the apex one finds, almost constantly, especially on the upper surface, the green cells, right at the surface. It is from these cells that the rhizoids originate. (Fig. 2. B, C, and D).

Second—The formation of rhizoids upon perichaetial leaves, Correns finds only upon unfertilized female blossoms. They take their origin from rows of chlorophyll-bearing cells lying between hyaline cells on the back of the leaf (Fig. 2. A). It is mainly the innermost leaves that produce the rhizoids. These intertwine and form quite a thick grey felt and may grow from stem to stem. Protonemata he never found upon them nor ever any young plantlets.

Third—Brutblätter (brood-leaves), according to Correns arise on special shoots which may occur upon the same plant year after year. The leaves upon any one shoot diminish gradually in size from base to apex. At the base they run into the ordinary leaves. In shape they resemble ordinary leaves. They are composed of three layers of cells (a net work of chlorophyll bearing cells lying in between an upper and a lower layer of hyaline water bearing cells) quite like a thin ordinary Leucobryum leaf, but are provided with chlorophyll bearing cells superficially arranged upon the upper side at the tip and upon the under side at the base which function as rhizoid producers, producing the latter sometimes only at the apex, sometimes only at the base. Experimenting with the "Brutblätter" in nutrient solution Correns observed that protonemata were produced quite quickly sometimes from both apex and base, sometimes from base alone. Within a month very many young plants had formed.

Correns states, that apparently this last mode of asexual reproduction has not as yet been observed but that it occurs quite frequently. Since having my attention called to the fact, I have noticed that in the case of many tufts of this moss very many small leaves are made to fly off by simply rubbing the hand lightly over the top of the tuft; no doubt these are the Brutblätter Correns refers to.

Comparing the three modes, we note that in all cases, rhizoids are produced; in the case of the ordinary leaves, they arise from the upper side near the apex; in the case of perichaetial leaves, from the under side near the middle; and in the case of the Brutblätter from the under side at the base.

Both the specimens found are examples of the second mode of asexual reproduction, but although one was found a few months later than the other, I do not observe the slightest difference between them. As already stated, this mode is said to be quite common, but thus far, I have observed it but twice, in spite, too, of the fact that during the past year I made especial effort to find more cases. Others, also, to whom I have shown specimens, have never seen it, so possibly it may not be so very common after all. I would be pleased to hear from those who have observed it.

Correns never found any protonemata upon the rhizoids nor ever any plantlets, nor were either found upon any of my specimens.

In Dr. Grout's "Mosses with Hand-lens and Microscope," there is an illustration (Plate II) taken from Schimper's "Recherches," showing this particular mode of reproduction. Those interested in the asexual reproduction of mosses should read this chapter in Dr. Grout's book, and also Dr. Best's article on "Vegetative Reproduction of Mosses" in the BRYOLOGIST for January, 1901.

Any member of the Sullivant Moss Society, wishing to have a small specimen of the *Leucobryum glaucum* showing this interesting "radicular tomentum" may get one by sending a self-addressed envelope to the writer.

My thanks are due to Mrs. Annie Morrill Smith for her many courtesies.

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